

# PATENT ABSTRACTS OF JAPAN

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(71)Applicant : HONDA MOTOR CO LTD

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(72)Inventor : OKAYAMA TATSUYA

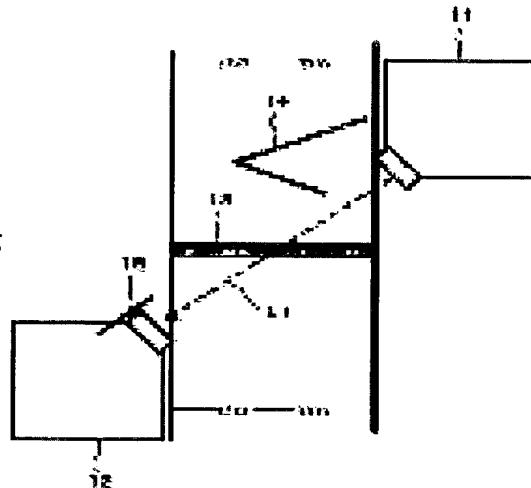
ARIZAKA ATSUSHI

## (54) OZONE PURIFYING DEVICE FOR VEHICLE

### (57)Abstract:

PROBLEM TO BE SOLVED: To provide an ozone purifying device for vehicle provided with a function capable of surely diagnosing a sticking state of foreign matters such as dust to an ozone purifying catalyst.

SOLUTION: Ozone in the atmosphere is purified by supporting an ozone purifying catalyst on the surface of a radiator 1. In the radiator 1, a stain measuring plate 13, a light emitting part 11 and a light receiving part 12 are arranged. Light quantity IL1 of light beam L1 transmitting the stain measuring plate 13 is detected by the light receiving part 12. When the detected light quantity IL1 becomes a prescribed threshold value ILTH or below, a warning that purifying performance of the ozone purifying catalyst is lowered is given to a driver.



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**CLAIMS**

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[Claim(s)]

[Claim 1] The ozone purge for vehicles characterized by having the thermolysis means prepared in vehicles, the ozone purification means supported by the front face of this thermolysis means, a presumed means to presume the amount of the affix adhering to this ozone purification means, and a diagnostic means to diagnose the operating state of the aforementioned ozone purification means according to the output of this presumed means.

[Claim 2] The ozone purge for vehicles characterized by having the thermolysis means prepared in vehicles, the ozone purification means supported by the front face of this thermolysis means, an air-capacity detection means to detect the air capacity which passes the aforementioned thermolysis means, and a diagnostic means to diagnose the operating state of the aforementioned ozone purification means according to the output of this air-capacity detection means.

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**DETAILED DESCRIPTION**

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[Detailed Description of the Invention]

[0001]

[The technical field to which invention belongs] this invention relates to what especially vehicles equip with and is used about the ozone purge which purifies the ozone in the atmosphere (O<sub>3</sub>).

[0002]

[Description of the Prior Art] When vehicles run, paying attention to air contacting and flowing on the body front face, radiator front face, etc., an ozone purification catalyst is arranged into such a portion, and the equipment which purifies the ozone in the atmosphere is proposed conventionally (\*\*\*\*\* No. 507289 [ 11 to ] official report).

[0003]

[Problem(s) to be Solved by the Invention] In such an ozone purge, when foreign matters, such as dust, adhere to the front face, the amount of ozone which the dust especially whose particle size is several microns invades into a catalyst bed, and checks diffusion of the ozone in a catalyst bed, or contacts a catalyst by blinding etc. is decreased. Therefore, the amount of ozone purified by the catalyst decreased and there was a problem that the decontamination-capacity force of an ozone purge will decline.

[0004] this invention is made paying attention to this point, and it aims at offering the ozone purge for vehicles equipped with the function which can carry out things to diagnose certainly the state where foreign matters, such as dust, adhered.

[0005]

[Means for Solving the Problem] In order to attain the above-mentioned purpose, invention according to claim 1 provides the ozone purge for vehicles which carries out

[ having had the heat-dissipation means prepared in vehicles, the ozone purification means which were supported by the front face of this heat-dissipation means, a presumed means presume the amount of the affix adhering to this ozone purification means, and a diagnostic means diagnose the operating state of the aforementioned ozone purification means according to the output of this presumed means, and ] as the feature.

[0006] Since according to this composition the amount of the affix adhering to this ozone purification means is presumed and the operating state of an ozone purification means is diagnosed according to the this presumed amount of affixes, the state where foreign matters, such as dust, adhered to the ozone purification means is diagnosed certainly, purification performance degradation is detected, and it becomes possible to emit warning to an operator.

[0007] The ozone purge for vehicles characterized by to equip invention according to claim 2 with the heat-dissipation means prepared in vehicles, the ozone purification means supported by the front face of this heat dissipation means, an air-capacity detection means detect the air capacity which passes the aforementioned heat dissipation means, and a diagnostic means diagnose the operating state of the aforementioned ozone purification means according to the output of this air-capacity detection means is provided.

[0008] Since according to this composition the air capacity which passes a heat dissipation means is detected and the operating state of an ozone purification means is diagnosed according to the this detected air capacity, the state where foreign matters, such as dust, adhered to the ozone purification means is diagnosed certainly, purification performance degradation is detected, and it becomes possible to emit warning to an operator.

[0009] The aforementioned presumed means has the light-emitting part which irradiates light at the dirt measurement board which is arranged near the aforementioned heat dissipation means, and is made to penetrate light, and/or reflects light, and this dirt measurement board, and the light sensing portion which detects the quantity of light of the light which penetrates the aforementioned dirt measurement board, or the light reflected to a desirable bird clapper. Moreover, the aforementioned presumed means is established in the middle of the air duct arranged near the aforementioned heat dissipation means, and this air duct, and is desirable. [ of the filter which air and light can be passed and carries out the uptake of the dust of the size more than predetermined the light-emitting part which irradiates light at this filter, and the light sensing portion which detects the quantity of light of the light

which penetrates the aforementioned filter, or the light reflected to a bird clapper ] [0010] Moreover, the aforementioned presumed means is established in the middle of the air duct arranged near the aforementioned heat dissipation means, and this air duct, and may consist of a filter which air and light can be passed and carries out the uptake of the dust of the size more than predetermined, and a pressure sensor prepared in the upstream and downstream of this filter. In this case, since it depends for the detection pressure by the pressure sensor on the vehicle speed of the vehicles concerned, as for the aforementioned diagnostic means, it is desirable to amend a detection pressure according to the vehicle speed, and to diagnose the operating state of the aforementioned ozone purification means.

[0011] Moreover, as for the aforementioned air duct, it is desirable to constitute so that the light which carries out incidence to the aforementioned light-emitting part and a light sensing portion from the outside may not reach. When the quantity of light detected by the aforementioned light sensing portion becomes below a predetermined threshold, as for the aforementioned diagnostic means, it is desirable to judge with the purification performance of the aforementioned purification means having fallen, and to emit warning.

[0012] As for the aforementioned air-capacity detection means, it is desirable to consider as the wind-speed sensor formed the front or behind the aforementioned heat dissipation means. In this case, since it depends on the vehicle speed of the vehicles concerned for the wind speed detected by the wind-speed sensor, as for the aforementioned diagnostic means, it is desirable to amend the detected wind speed according to the vehicle speed, and to diagnose the operating state of the aforementioned ozone purification means. Specifically, when the wind speed detected by the aforementioned wind-speed sensor is amended according to the vehicle speed and the wind speed after amendment becomes below a predetermined threshold, as for the aforementioned diagnostic means, it is desirable to judge with the purification performance of the aforementioned purification means having fallen, and to emit warning.

[0013]

[Embodiments of the Invention] The form of operation of this invention is explained with reference to a drawing below.

(1st operation form) Drawing 1 and 2 are drawings showing the composition of the ozone purge concerning the 1st operation form of this invention, and while making the front face of the radiator 1 of vehicles support an ozone purification catalyst, in order to detect the amount of the affix (dirt) adhering to the front face of a radiator 1, this

equipment is equipped with the amount detecting element of affixes, and is constituted. As an ozone purification catalyst, as shown, for example in JP,5-317717,A, what makes a principal component manganese carbonate (MnCO<sub>3</sub>) and manganese oxide (MnO<sub>x</sub>) is used. A radiator 1 is the heat dissipation means established in order to reduce the temperature of the engine cooling water which cools the engine (not shown) of the vehicles concerned.

[0014] Drawing 1 (b) is drawing expanding and showing the A section of this drawing (a), and drawing 2 is drawing for explaining the composition of the amount detecting element of affixes seen from the B-B line cross section of drawing 1 (b). The amount detecting element of affixes as a light emitting device specifically For example, the light-emitting part 11 constituted by carrying out the internal organs of the light emitting diode, As a photo detector, for example, the light sensing portion 12 constituted by carrying out the internal organs of the photo transistor, The dirt measurement board 13 which the beam of light L1 discharged from a light-emitting part 11 is formed [ board ] on the path which carries out incidence to a light sensing portion 12, and makes light penetrate, It covers, and becomes dirty and avoids so that the portion the beam of light L1 of the portion which discharges the beam of light L1 of a light-emitting part 11, and a light sensing portion 12 carries out [ a portion ] incidence may not become dirty. Hoods 14 and 15, It connected with the light-emitting part 11 and the light sensing portion 12, and has the electronic control unit (henceforth "ECU") 16 which judges the amount of the affix which became dirty based on the quantity of light detected by the light sensing portion 12, and adhered to the measurement board 13.

[0015] The dirt measurement board 13 deletes some fins 2 of a radiator 1, and is installed in the travelling direction of the vehicles concerned, and parallel. the state of the dirt of the dirt measurement board 13, i.e., the amount of an affix Since it can consider that it is almost the same as that of the state of the dirt of the ozone purification catalyst supported by the front face of the fin 2 grade of a radiator 1, ECU16 When the quantity of light IL 1 of the beam of light L1 which passes the dirt measurement board 13 is detected and the quantity of light IL 1 becomes below the judgment threshold ILTH, the warning lamp in which it is shown that the purification performance of an ozone purification catalyst fell is made to turn on.

[0016] It becomes dirty, and it can avoid, and the dirt of the portion in which the beam of light L1 of the portion which discharges the beam of light L1 of a light-emitting part 11, and a light sensing portion 12 carries out incidence with hoods 14 and 15 can be prevented, and the influence of partial dirt other than dirt measurement board 13 can

be removed. With this operation form, a radiator 1 is equivalent to a heat dissipation means, the dirt measurement board 13, a light-emitting part 11, and a light sensing portion 12 are equivalent to a presumed means, and ECU16 is equivalent to a diagnostic means.

[0017] (Modification 1) Drawing 3 is drawing showing the modification of composition of being shown in drawing 1 (b). It has two light-emitting parts 11a and 11b and two light sensing portions 12a and 12b which counter this, it becomes dirty between light-emitting part 11a and light sensing portion 12a, and the measurement board 13 is formed, and the amount detecting element of affixes consists of this example so that the output of light sensing portions 12a and 12b may be supplied to ECU16. Light sensing portion 12a receives beam-of-light L1a which passes the dirt measurement board 13, light sensing portion 12b receives directly beam-of-light L1b discharged from light-emitting part 11b, and each light-receiving quantity of light ILa and ILb is detected by ECU16. ECU16 makes the warning lamp in which it is shown that the purification performance of an ozone purification catalyst fell turn on, when the difference DIL of the light-receiving quantity of light ( $=ILb-ILa$ ) becomes below the predetermined threshold ILTHa, or when the ratio RIL ( $=ILa/ILb$ ) of the light-receiving quantity of light becomes below the predetermined ratio RILTH.

[0018] According to this modification, since it is thought that the degree of the dirt of light-emitting parts 11a and 11b and the degree of the dirt of light sensing portions 12a and 12b are almost the same, the influence of the state of the dirt of a light-emitting part and a light sensing portion can be offset, and the state of the dirt of the dirt measurement board 13 can be detected correctly.

[0019] (2nd operation gestalt) Drawing 4 (a) is drawing showing the composition of the amount detecting element of affixes of the ozone purge concerning the 2nd operation gestalt of this invention. With this operation gestalt, the air duct 21 which has entrance 21a and outlet 21b is formed, a filter 31 is arranged in the middle of an air duct 21, and a light-emitting part 11 and a light sensing portion 12 detect the quantity of light IL 2 of the beam of light L2 which passes a filter 31 so that air may pass in the direction of X of drawing in connection with a rolling stock run. A filter 31 shall intercept larger dust than about 100 microns.

[0020] With this operation gestalt, the air which passed the radiator 1 for the air duct 21 of the amount detecting element of affixes as shown in drawing 5 (a) or this drawing (b) arranges so that an air duct 21 may be passed. Or you may make it arrange entrance 21a of an air duct 21 from a radiator 1 to an anterior so that the uptake of the air homogeneous as the air which flows into a radiator 1 may be carried out as

shown in this drawing (c). Moreover, the position of the cross direction of vehicles may arrange a crosswise outside etc. to any for a while near the center of a radiator 1, near an edge, or from a radiator 1, as shown in drawing 6. With this operation gestalt, a radiator 1 is equivalent to a thermolysis means, a filter 31, a light-emitting part 11, and a light sensing portion 12 are equivalent to a presumed means, and ECU16 is equivalent to a diagnostic means.

[0021] (Modification 1) Drawing 4 (b) is drawing showing the modification of the composition of this drawing (a), and a light sensing portion 12 detects the quantity of light of not the transmitted light L2 of a filter 31 but reflected ray L2a.

[0022] (Modification 2) Drawing 4 (c) is drawing showing the modification of the composition of this drawing (b) further. With the composition of this drawing (a) and (b), since light carries out incidence from entrance 21a of an air duct 21, or outlet 21b, and the amount detection of affixes is affected, i.e., the detection quantity of light increases and it may judge with there being actually more little dirt, the straight-line-like air duct 21 is replaced with the air duct 22 made crooked 90 degrees 4 times. this modification -- getting twisted -- even if light carries out incidence from entrance 22a or outlet 22b, the influence can be lost and it becomes detectable [ the more exact amount of affixes ]

[0023] (Modification 3) As shown in drawing 7 (a) and (b) again, you may constitute so that entrance 21a of an air duct 21 may carry out opening to the exterior of a bonnet. (Modification 4) Drawing 8 is drawing showing other modifications, and adds a filter 32 to the composition shown in drawing 4 (a) and (b) further. By forming a filter 32, advance of the dirt of a filter 31 becomes slow and the prolonged surveillance of it is attained. That is, corresponding to the dust-proof performance of an ozone purification catalyst, when the surveillance over a long period of time is comparatively required, it is suitable.

[0024] (Modification 5) Drawing 9 is drawing showing other modifications, is replaced with a filter 31 and uses the same dirt measurement boards 13a or 13 as the 1st operation gestalt. In the example shown in drawing 9 (a), the amount of affixes is detected by arranging dirt measurement board 13a with the high reflection factor of light on the base of an air duct 21, and detecting the amount of reflected lights of dirt measurement board 13a.

[0025] In the example shown in drawing 9 (b), the amount of affixes is detected by forming the dirt measurement board 13 with the high permeability of light in the portion which discharges the light of a light-emitting part 11, and the portion in which the light of a light sensing portion 12 carries out incidence, and detecting the amount

of transmitted lights of two dirt measurement boards 13. Thus, by arranging a dirt measurement board to the flow of air, and parallel, prolonged surveillance is attained compared with the case where the filter 31 perpendicularly arranged to the flow of air is used.

[0026] (Modification 6) When the vehicles concerned run at top speed, as are shown in drawing 10, and the waterdrop 100 which invades from the entrance of an air duct 21 shows with an alternate long and short dash line 101, this modification is before the trap network 33, and is discharged from an exhaust port 41. In the time of the run by the usual vehicle speed, from an exhaust port 41, waterdrop 100 is this side and falls on the base of a path 21. The trap network is prepared in order to make it small dust, a small insect, etc. not reach a filter 31. According to this modification, waterdrop can adhere to a filter 31 or it can prevent that small dust and a small insect adhere.

[0027] Moreover, as shown in drawing 11 (a), while attaching the trap network 33 aslant, it is desirable to enlarge an exhaust port 41. Thereby, eccrisis of the dust stopped by the trap network 33 can be promoted. In drawing 12 (a), 10 shows the amount detecting element of affixes containing a light-emitting part and a light sensing portion, and a filter.

[0028] In addition, you may adopt the composition shown in this drawing (b) and (c). The composition shown in this drawing (b) makes structure of an exhaust port 41 easier to discharge dust etc. Moreover, the composition shown in this drawing (c) forms the branching path 23, and arranges the amount detecting element 10 of affixes, and the trap networks 33 and 34 in the middle of this branching path 23.

[0029] (3rd operation gestalt) This operation gestalt is made to detect the amount of affixes at not light but a pressure, or a wind speed. In the example shown in drawing 12 (a), the pressure sensors 51 and 52 which detect the pressure P1 of the upstream of the filter 31 in an air duct 21 and the pressure P2 of a downstream are formed, and the amount of affixes which adhered to the filter 31 with the pressure differential ( $=P1-P2$ ) or pressure ratio ( $=P1/P2$ ) is detected. The detecting signal of pressure sensors 51 and 52 is judged as there being many amounts of affixes, so that ECU16 is supplied and a pressure differential (or pressure ratio) becomes large. Since a detection pressure changes with the vehicle speed VP, ECU16 performs amendment according to the vehicle speed VP detected by the vehicle speed sensor 53. When it amends so that the pressure differential (pressure ratio) obtained from a sensor output may be made small and the pressure differential after amendment (pressure ratio) specifically exceeds a predetermined threshold so that the vehicle speed VP was high, a warning lamp is made to turn on and it warns an operator of the

purification performance of an ozone purification catalyst having fallen.

[0030] In the example shown in this drawing (b), to the downstream (posterior) of a radiator 1, with moreover, the radiator fan 62 The fan shroud 61 for raising the radiator fan's 62 cooling efficiency is formed. The upstream of a radiator 1 (anterior), Pressure sensors 51 and 52 are formed in a downstream (posterior), and the amount of affixes of the front face of a radiator 1 is detected according to the difference (or pressure ratio) and the vehicle speed VP of a pressure which are detected by these pressure sensors. Furthermore, only a pressure sensor 52 is formed (deleting a pressure sensor 51), and you may make it detect the amount of affixes of the front face of a radiator 1 based on a pressure differential with the time of the radiator fan's 62 operation at the time of a vehicles halt, and un-operating.

[0031] Moreover, as shown in drawing 13, the wind-speed sensor 54 is formed in the upstream (this drawing (a)) or downstream (this drawing (b)) of a radiator 1, and you may make it detect the amount of affixes on the front face of a radiator according to the wind speed VW detected by this wind-speed sensor, and the vehicle speed VP. In this case, it is judged with there being many amounts of affixes, so that a wind speed VW compares vehicle speed VP and becomes low. Moreover, as a wind-speed sensor 54, a thing as shown, for example in drawing 14 is used. When the wind speed VW detected by the wind-speed sensor 54 is amended according to the vehicle speed VP and the wind speed after amendment becomes below a predetermined threshold, ECU16 makes a warning lamp turn on and warns an operator of the purification performance of an ozone purification catalyst having fallen. With this operation gestalt, a filter 31 and pressure sensors 51 and 52 are equivalent to a presumed means, the wind-speed sensor 54 is equivalent to an air-capacity detection means, and ECU16 is equivalent to a diagnostic means.

[0032]

[Effect of the Invention] Since according to invention according to claim 1 the amount of the affix adhering to this ozone purification means is presumed and the operating state of an ozone purification means is diagnosed according to the this presumed amount of affixes as explained in full detail above, the state where foreign matters, such as dust, adhered to the ozone purification means is diagnosed certainly, purification performance degradation is detected, and it becomes possible to emit warning to an operator.

[0033] Since according to invention according to claim 2 the air capacity which passes a heat dissipation means is detected and the operating state of an ozone purification means is diagnosed according to the this detected air capacity, the same

effect as invention according to claim 1 is done so.

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#### DESCRIPTION OF DRAWINGS

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[Brief Description of the Drawings]

[Drawing 1] It is drawing showing the composition of the ozone purge concerning the 1st operation gestalt of this invention.

[Drawing 2] It is drawing for explaining the composition of the amount detecting element of affixes seen from the B-B line cross section of drawing 1 (b).

[Drawing 3] It is drawing showing the modification of composition of being shown in drawing 1.

[Drawing 4] It is drawing showing the composition of the amount detecting element of affixes of the ozone purge concerning the 2nd operation gestalt of this invention.

[Drawing 5] It is a side elevation for explaining the attaching position of the amount detecting element of affixes shown in drawing 4.

[Drawing 6] It is the front view for explaining the attaching position of the amount detecting element of affixes shown in drawing 4.

[Drawing 7] It is a perspective diagram for explaining the example which establishes the entrance of the air duct of the amount detecting element of affixes in the outside of a bonnet.

[Drawing 8] It is drawing showing the modification of composition of being shown in drawing 4.

[Drawing 9] It is drawing showing other modifications of composition of being shown in drawing 4.

[Drawing 10] It is drawing showing other modifications of composition of being shown in drawing 4.

[Drawing 11] It is drawing showing the modification of composition of being shown in drawing 10.

[Drawing 12] It is drawing showing the composition of the amount detecting element

of affixes of the ozone purge concerning the 3rd operation gestalt of this invention.

[Drawing 13] It is drawing showing the modification of composition of being shown in drawing 12.

[Drawing 14] It is the perspective diagram showing the wind-speed sensor of drawing 13.

[Description of Notations]

1 Radiator (Thermolysis Means)

10 The Amount Detecting Element of Affixes (Presumed Means)

11 Light-emitting Part (Presumed Means)

12 Light Sensing Portion (Presumed Means)

13 13a Dirt measurement board (presumed means)

16 Electronic Control Unit (Diagnostic Means)

21 22 Air duct (presumed means)

31 32 Filter (presumed means)

51 52 Pressure sensor (presumed means)

53 Vehicle Speed Sensor (Air-Capacity Detection Means)

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[Translation done.]